## REMARKS

Claims 19, 21, 28 and 31-33 have been amended and new claim 36 added. Claim 19 is amended to specify that the film stuck onto the photosensitive resin layer is the "protecting film." Claims 21, 28 and 31-33 were amended to add recite the "protecting film" as recited in claim 19. New claim 36 particularly points out and distinctly claims a preferred embodiment that includes the subject matter of claim 1 and additionally recites that generation of air voids in the photosensitive resin layer does not exceed 5 air voids/$m^2$ when measured under a microscope at a multiplication of 100 following lamination of the photosensitive film and removal of the protecting film as supported by the disclosure on page 18, lines 2-5; and Table 2 on page 19 of the present specification.

Applicants believe that the amendment to the present application adds no new matter and is believed to add raise no substantial new issues.

**The Invention**

The present invention pertains to a photosensitive film such as would be used in metal etching fabrications for lead frames, metal masks, and the like. Specifically, the photosensitive film in accordance with claim 1 is characterized by: a support film (A), a photosensitive resin composition-containing photosensitive resin layer (B) formed on said support film (A), and a protecting film (C) stuck onto said photosensitive resin layer (B), wherein the number of fish eyes having a diameter of at least 80 μm included in said protecting film (C) does not exceed 5 fish eyes/$m^2$ when measured under a microscope at a multiplication of 100; and said

photosensitive resin composition-containing photosensitive resin layer (B) has a film thickness of 5 to 30 μm.

In yet another preferred embodiment in accordance with new claim 36, the photosensitive film is characterized by: a support film (A), a photosensitive resin composition-containing photosensitive resin layer (B) formed on said support film (A), and a protecting film (C) stuck onto said photosensitive resin layer (B), wherein the number of fish eyes having a diameter of at least 80 μm included in said protecting film (C) does not exceed 5 fish eyes/$m^2$ when measured under a microscope at a multiplication of 100; and said photosensitive resin composition-containing photosensitive resin layer (B) has a film thickness of 5 to 30 μm, wherein generation of air voids in said photosensitive resin composition-containing photosensitive resin layer (B) does not exceed 5 air voids/$m^2$ when measured under a microscope at a multiplication of 100 following lamination of the photosensitive film and removal of the protecting film.

The photosensitive film in accordance with the preferred embodiments of the present invention as recited in the claims is advantageous over the prior art photosensitive films because by limiting the number of fish eyes having a diameter of at least 80 μm to not exceed 5 per square meter when measured under a microscope at a multiplication of 100 when photosensitive layer having a film thickness of 5 to 30 μm is used an improved photosensitive layer results. In other words, by minimizing the number of relatively large fish eyes in the protecting layer, the photosensitive film of the present invention limits the number of air voids formed in the photosensitive layer. Because the presence of air voids causes the formation of defective patterns and the breakage of wire in the subsequent steps of exposure, development and etching

(specification, page 3, lines 17-28) when manufacturing semiconductor elements and the like, it is desired that the protecting layer have as few relatively large fish eyes as possible.

**The Rejections**

Claims 1-5, 7-10, 13, 14, 18, 19, 21-25, 28, 29 and 31 stand rejected under 35 U.S.C. 103(a) as unpatentable over Hilger (U.S. Patent 4,698,292) in view of Fifield (German document DE 3,825,782 A1). Claims 1-10, 13-19, 21-25 and 28-35 stand rejected under 35 U.S.C. 103(a) as unpatentable over Taguchi (U.S. Patent 4,360,582) in view of Fifield. Claims 12 and 27 stand rejected under 35 U.S.C. 103(a) as unpatentable over Taguchi in view of Fifield, and further in view of Hoffman (U.S. Patent 4,710,446). Claims 11 and 26 stand rejected under 35 U.S.C. 103(a) as unpatentable over Taguchi in view of Fifield, and further in view of Hatanaka (U.S. Patent 6,133,343).

Applicants respectfully traverse the rejection and request reconsideration for the following reasons.

**Applicants' Arguments**

The Hilger reference discloses a photopolymerizable recording material that includes a transparent support film, a thermoplastic photopolymerizable photoresit layer, and a flexible covering film on the exposed surface of the photoresist layer (see Abstract). The support film is about 15 to 30 $\mu$m thick (col. 4, lines 42-45). The photopolymerizable layer includes a thermoplastic binder, polymerizable compounds (acrylic or methacrylic acid esters of polyhydric aliphatic hydroxyl compounds), and a photopolymerization initiator (col. 4, lines 45-50). The photopolymerizable layer also may include polymerization inhibitors, dyes, pigments, plasticizers

and crosslinking agents, and is about 10 to 100 μm thick (col. 4, lines 50-54). In addition, Hilger discloses that the covering film is made of polyolefin (col. 3, lines26-28) and is about 5 to 25 μm thick (col. 4, lines 44-45).

First, Applicants do not believe that the "recording material" disclosed by Hilger is in the same field of endeavor as the present invention. Specifically, the main objective for Hilger is to provide a recording material that does not show any adverse squeezing out of the photopolymerizable layer at the material edges when stored in a roll (col. 1, lines 59-63). The subject matter of the Hilger reference has nothing to do with photosensitive films which can be laminated by conventional pressure lamination methods onto a surface of a substrate that has a metallic surface for the purpose of providing a high product yield that has a high workability and a reduced number of air voids (specification, page 4, lines 22-27). Consequently, Applicants assert that the Hilger reference is directed to a non-analogous art, and that one skilled in the art of making photosensitive films for metal etching fabrication would not look to the art of making recording materials for technology.

Even if the Hilger reference where deemed relevant to the subject matter of the present invention (which it is not), the Hilger reference fails to teach a protecting layer that has the number of fish eyes having a diameter of at least 80 μm that does not exceed 5 fish eyes/$m^2$ when measured under a microscope at a multiplication of 100 as admitted by the Examiner (Office Action, dated November 27, 2001, page 3, lines 15-17; and Office Action, dated April 16,2002, page 3, lines 16-17), which is subject matter recited in claims 1, 19 and 36. Applicants point out that the Hilger reference does not address the issue of the formation of air voids that is related to the film thickness of the photosensitive resins layer wherein thinner photosensitive resin layers

are more prone to the formation of air voids (see present specification, page 3, lines 22-25). Therefore, Hilger can not remotely teach or suggest, the property of the photosensitive film wherein generation of air voids in the photosensitive resin layer does not exceed 5 air voids/$m^2$ when measured under a microscope at a multiplication of 100 following lamination of the photosensitive film and removal of the protecting film as recited in claim 36.

The Fifield reference discloses a dry film photoresist used in manufacturing PCBs that is formed as a roll including a photopolymerisable film (P) laminated between a base film (B) and a covering film (C), (see English Abstract). Fifield provides the general teaching that by avoiding low quality LDPE the roll is made more even because the covering film contains less gell and fewer inclusions, which reduces the number of indentations in the resist. In other words, Fifield discloses that by avoiding low quality materials, such as low quality LDPE, that the roll can be improved. All the Fifield reference discloses is the desirability to make a roll more even by making the covering film with less gell and fewer inclusion. The Fifield reference does not disclose any workable ranges or what is meant by "less gel" and "fewer inclusions." The Examiner takes the general teaching of the English abstract that "less gel" and "fewer inclusions" is desirable and concludes that "[i]t would have been obvious to one of ordinary skill to make as few inclusions as possible and the determination of optimal results can be achieved by routine experimentation" (Office Action dated April 16, 2002, page 4, lines 1-3).

There are multiple flaw's in the Examiner's reasoning as follows. First, the Examiner ignores the fact that the Fifield reference discloses that "fewer inclusions" are attained by avoiding low quality LDPE (polyethylene film) by using high quality LDPE (polyethylene film). The teachings of the Fifield reference can not be applied to the Hilger reference unless the

recording material disclosed by Hilger is made with low quality LDPE. However, there is nothing in the Hilger reference that teaches, or even suggests, that the recording material disclosed by the Hilger reference is made with low quality LDPE. Therefore, not only is there no reasonable motivation to apply the teaching of the Fifield reference to the recording material disclosed by Hilger, but also there is no reasonable expectation of success.

Another flaw in the Examiner's reasoning is the assumption that minimizing the number of inclusions is a simple matter of routine optimization. The formation of inclusions depends upon multiple variables and is not a simple parameter such as temperature.

Applicants attach hereto a Declaration under 37 C.F.R. 1.132 (unsigned) establishing that the formation of voids should increase as thickness of the photosensitive resin layer falls below 40 $\mu$m and into the claimed range of thickness. A signed Declaration will be filed shortly. This establishes the problem the solution of which led to the present invention, which is neither taught, nor suggested by the prior art. Therefore, there would be no motivation to apply the teaching of Fifield et al. to the recording material taught by Hilger because the combination of the art would be expected to generate more air voids than is allowed by claim 36, for example.

Furthermore, the Declaration also provides evidence that the number of fish eyes present in a polyethylene protecting film, such as taught by Fifield et al., would clearly exceed the 5 fish eyes/$m^2$ when measured under a microscope at a multiplication of 100. In fact, the number of fish eyes/$m^2$ would exceed the maximum value as recited in claim 1, 19 and 36 by about 200-fold.

However, the present invention recites a protecting layer that has the number of fish eyes having **a diameter of at least 80 μm that does not exceed 5 fish eyes/$m^2$** when measured under a microscope at a multiplication of 100. As shown in Table 2 of the specification, the present invention is directed to using a number of different protecting films (see Table 2) that provide remarkably flawless protecting films; however, these protecting films are not LDPE films. In fact, polyethylene films such as NF-13 of Comparative Example 1 of Table 2 from the present specification, have about 1,000 fish eyes per $m^2$, whereas all of the Examples 1-2 and 4 in accordance with the present have no fish eyes!

These results demonstrate superior and unexpected results. So, even if one where to assume that the number of fish eyes is a result effective variable that can be optimized as a matter of routine optimization (which is not a reasonable assumption in view of the facts), there is the unexpected result wherein the photosensitive films made in accordance with Examples 1-3 and 4 have no fish eyes compared to the 1000 fish eyes/$m^2$ in photosensitive films made with polyethylene films. Unexpected results following from applicant's critical range can overcome a *prima facie* case of obviousness using optimization as its basis. In re Waymount and Koury, 182 USPQ 290, 293 (CCPA 1974).

Applicants remind the Examiner that in order to make a proper rejection under 35 U.S.C. 103, the following criteria must be met: (1) the prior art must teach a motivation to combine the references, (2) the combination of the art must have a reasonable expectation of success, and (3) the combination must teach all of the claimed elements. *In re Vaeck,* 20 USPQ2d 1438, 1442. As shown by the Applicants, the Examiner has not established a single one of these three criteria.

Applicants also point out that the photopolymerizable film (P) adheres more strongly to covering film (C) that to the base film (B) so that the base film acts as a release film (see English Abstract). This is contrary to the present invention, wherein the protecting film is removed at the time of lamination (see Claim 3 and specification, page 14, lines 28 to page 15, line 13),a property now recited in claim 36. Therefore, the covering film of the Fifield reference is retained in the roll together with the gell and inclusions, while in the present invention the protecting film is removed at the time of lamination on the substrate and is not retained together with the fish eyes. Thus, the mechanism and function of the covering film disclosed by Fifield is quite different from those of the protecting film of the present invention, and the combination of the Hilger and Fifield references is unreasonable since the object of the Hilger reference is to prevent squeezing out of the photopolymerizable substance during storage in a roll, while the object of the Fifield film is to make the roll surface of dry photoresist even by making the covering film contain less gell and fewer inclusions. In addition, the combination of Hilger and Fifield references does not accomplish the present invention since the protecting film is not retained in the final laminate, but is removed at the time of lamination on a substrate in contrast to the teaching of Fifield; and, air voids are not reduced remarkably according to the teaching of both references since both references have no inventive idea of reducing the air voids, which are derived from fish eyes in the protecting film.

Moving on, the Taguchi reference discloses a "photopolymerizable element" for producing photoresists used in manufacturing printed circuit boards that includes: (1) a layer of a photopolymerizable composition, (2) a film support laminated to the composition layer and (3) a strippable protective film (see Abstract). The thickness of the composition layer is 0.1 to 1,000 $\mu$

(col. 9, lines 15-19) with the thickness of the film support being 5 to 100 $\mu$ (col. 9, lines 20-22) and the thickness of the protective film being 8 to 80 $\mu$ (col. 10, lines 22-23). Numerous materials are available for making the protective layer, but there is no mention of using low quality LDPE. Taguchi discloses that the protective film is provided on one surface of the photopolymerizable layer and the film support is laminated onto the other surface, wherein the protective layer is used for preventing blocking at the winding step and adhesion of dust during handling (col. 3, lines 62-68). As admitted by the Examiner (Office Action, dated November 27, 2001, page 5, lines 7-8), the Taguchi reference does not teach "explicit details pertaining to the protective film" such as a protecting layer that has the number of fish eyes having **a diameter of at least 80 $\mu$m that does not exceed 5 fish eyes/m$^2$** when measured under a microscope at a multiplication of 100.

Applicants point out that the Taguchi reference does not teach making the protective layer from low quality LDPE; therefore, as discussed above there in no proper motivation for applying the teachings of the Fifield reference to make up the deficiencies of the Taguchi reference. In addition, the combination of the teachings of the Taguchi reference and the Fifield reference has no reasonable expectation for success because the Fifield reference provides no teaching for improving upon a protective layer unless the protective layer is made of low quality LDPE, and there is no teaching to support that the Taguchi protective layer includes this material. Lastly, even if the combination of the Taguchi reference and the Fifield reference were improperly made for the sake of argument, the combination still would not teach a protecting layer with the number of fish eyes having **a diameter of at least 80 $\mu$m that does not exceed 5 fish eyes/m$^2$** when measured under a microscope at a multiplication of 100 because the Fifield reference is

silent with respect to what size are the "inclusions" and is vague about what is the magnitude of inclusions that is achieved by avoiding the low quality LDPE. As evident from Table 2 of the present disclosure, the present invention achieves unexpectedly superior results by achieving a flawless protecting layer. As evident from Table 2 of the Declaration, polyethylene protecting films such as used in the Fifield et al. reference cannot achieve the number of fish eyes as recited in claims 1, 19 and 36.

The subject matter of independent claims 1, 19 and 36 are neither anticipated by, nor made obvious in view of, the Hilger reference, the Fifield reference and the Taguchi reference, either singly or in combination for reasons above. Applicants have shown that no proper showing of *prima facie* case of obviousness has been made. Specifically, the Applicants have shown that the Examiner's combination of the Hilger reference, or the Taguchi reference, with the Fifield reference (1) lacks proper motivation, (2) lacks a reasonable expectation of success, and (3) fails to teach the subject matter of the independent claims.

The two remaining references are briefly described, but neither can make up the deficiencies of the Hilger reference, the Fifield reference and the Taguchi reference. The Hoffman reference discloses a photosensitive recording material for lithographic printing plates or resists images (See abstract). Hoffman is noted to teach various photoinitiators (col. 6, lines 9-27). The Hatanaka et al. reference discloses a "resinous composition for dental use" and is directed to a non-analogous field of endeavor pertaining to the making of dentures, mouth pieces and temporary crowns (col. 1, lines 5-10).

**Conclusion**

For all of the above reasons, claims 1-19 and 21-36 are neither anticipated by, nor obvious in view of, the prior art of record because the Examiner's combination of the Hilger reference, or the Taguchi reference, with the Fifield reference (1) lacks proper motivation, (2) lacks a reasonable expectation of success, and (3) fails to teach the subject matter of independent claims 1 and 36. Consequently, the Examiner's rejection is untenable and should be withdrawn, and the Applicants respectfully request that the application be reconsidered. Applicants believe that the present claims are in condition for allowance, and prompt notice of allowance is respectfully requested. Questions are welcomed by the below-signed attorney for applicants.

Respectfully submitted,

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## Marked Up Claims

19. (three times amended) A photosensitive film comprising a support film, a photosensitive resin layer on said support film, and a protecting film stuck onto said photosensitive resin layer, wherein the ~~said~~ protecting film has fish eyes of a diameter of at least 80μm in a number not exceeding 5 per square meter when measured under a microscope at a multiplication of 100.

21. (Twice amended) A photosensitive film according to Claim 19, wherein adhesive strength between the photosensitive resin layer and the support film is greater than adhesive strength between the photosensitive resin layer and the protecting film.

28. (Amended) A photosensitive film according to Claim 19, wherein the protecting film is a polypropylene film.

31. (Amended) A photosensitive film according to Claim 19, wherein the protecting film has a thickness of 5 to 50μm.

32. (Amended) A photosensitive film according to Claim 19, wherein the protecting film is a film removed at a time of lamination of the photosensitive film on a substrate.

33. (Twice amended) A process for laminating a photosensitive film on a substrate, which comprises laminating the photosensitive film of Claim 19 on a substrate, while removing the

protecting film so as to make the photosensitive resin layer adhere to the substrate having a metallic surface.

36. (NEW) A photosensitive film which comprises a support film (A), a photosensitive resin composition-containing photosensitive resin layer (B) formed on said support film (A), and a protecting film (C) stuck onto said photosensitive resin layer (B), wherein the number of fish eyes having a diameter of at least 80 μm included in said protecting film (C) does not exceed 5 fish eyes/$m^2$ when measured under a microscope at a multiplication of 100; and said photosensitive resin composition-containing photosensitive resin layer (B) has a film thickness of 5 to 30 μm, wherein generation of air voids in said photosensitive resin composition-containing photosensitive resin layer (B) does not exceed 5 air voids/$m^2$ when measured under a microscope at a multiplication of 100 following lamination of the photosensitive film and removal of the protecting film.